

# USDOT Connected Vehicle Activities Vehicle to Infrastructure Workshop

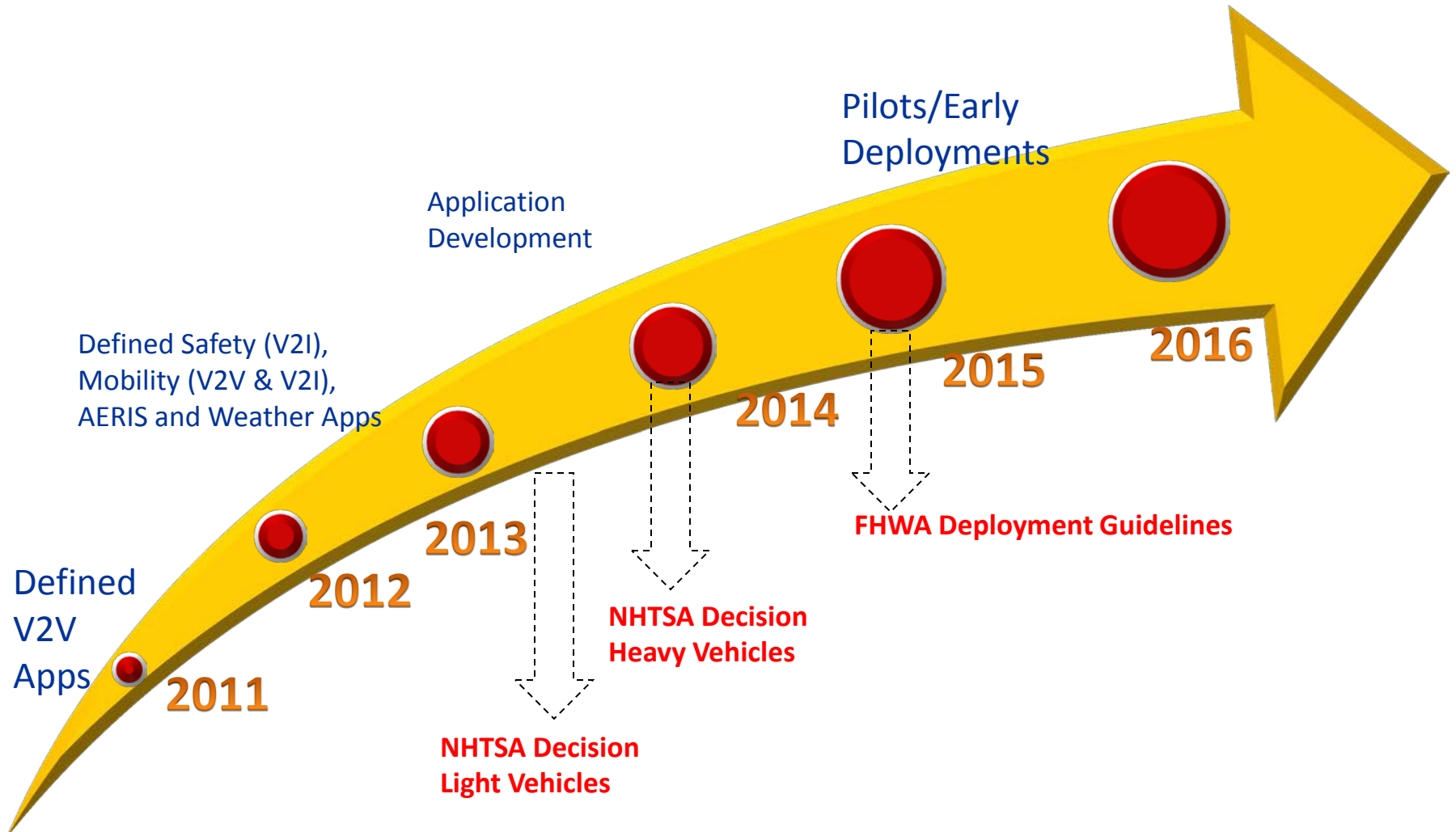


## FHWA 2015 V2I Deployment Guidance

# Welcome

- Robert Arnold  
Federal Highway Administration  
Director, Office of Transportation  
Management
- Jeffrey Lindley  
Federal Highway Administration  
Associate Administrator Office of Operations

# The Path To Deployment



# FHWA's Plans and Objectives

## Guidance on Infrastructure Implementation

- Guidance - not regulation
- What and how to implement infrastructure and supporting systems
  - Guidelines
  - Best Practices
  - Toolkit
- Supporting high-priority applications
  - V2I safety applications (crash warnings at traffic signals, etc.)
  - Dynamic mobility
  - Road-weather
  - Environmental
- Based on DOT research and AASHTO analysis of infrastructure needs and deployment approaches

# Structure of the meeting

- What's Happening?
- What are your needs?
  - Planning
  - Design and Integration
  - Institutional and Legal
  - Implementation
  - Operations
  - Transit/Multi-Modal
- How do you stay engaged?

# How do you stay engaged?

**RITA** U.S. Department of Transportation  
Research and Innovative Technology Administration

Intelligent Transportation Systems  
Joint Program Office

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RITA Updated January 14, 2014 9:44 AM

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**Public Meetings**  
All ITS JPO meetings and webinars are free and open to the public.  
View meetings.

**U.S. Department of Transportation Seeks Applications for Integrated Corridor Management Deployment Planning Grants**  
Read more...

**Our Current Research**  
Applications Mode-Specific Cross-Cutting

- ▶ Vehicle-to-Vehicle Safety
- ▶ Vehicle-to-Infrastructure Safety
- ▶ Real-Time Data Capture
- ▶ Dynamic Mobility Applications
- ▶ Environment
- ▶ Road Weather
- ▶ Connected Vehicle Policy

More >>

**CONNECTED VEHICLE TECHNOLOGY**  
Connected Vehicle Test Beds

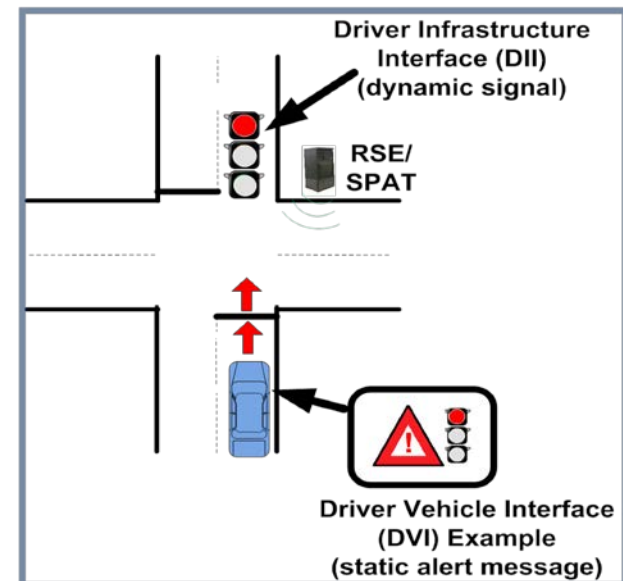
**Procurement Opportunities**  
As we implement the ITS Research Strategic Plan, open procurements may become available through a variety of solicitations. [More >>](#)

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# What is Happening?

- Ben McKeever and Deborah Curtis, Federal Highway Administration, Turner-Fairbank Highway Research Center



# AASHTO Footprint Analysis

- In 2012 USDOT requested AASHTO to form a team to conduct a national connected vehicle field infrastructure footprint analysis
  - Consider broad range of CV apps and scenarios
  - Include safety, mobility and environmental apps
  - Include light vehicles, transit, commercial vehicle and pedestrian apps
  - Include urban, rural, freeway, arterial, and freight/ intermodal facilities, and land border crossings
- Task awarded and initiated in November 2012



# Footprint Work Plan

## Completed Tasks

- Develop a Tech Memo to initiate engagement with State and local agencies (Task 3)
- Assess the range of CV applications to identify deployment bundles (Task 4)
- Develop deployment concepts (Task 5)

## Tasks Underway

- Develop deployment scenarios, a preliminary national footprint and cost estimates (Task 6) – Feb 2014
- Develop a Final Report (Task 7) – March 2014



## Vision for Connected Vehicle Infrastructure Footprint - 2040

- 80% of traffic signals are V2I connected with DSRC
- 25,000 other local safety V2I connected devices
- Accurate real-time localized information on 90+% of roadway miles\*
- Next-generation, multimodal, information-driven active traffic management deployed system-wide\*

\*enabled by both cellular and DSRC communications

Graphic Source: AASHTO

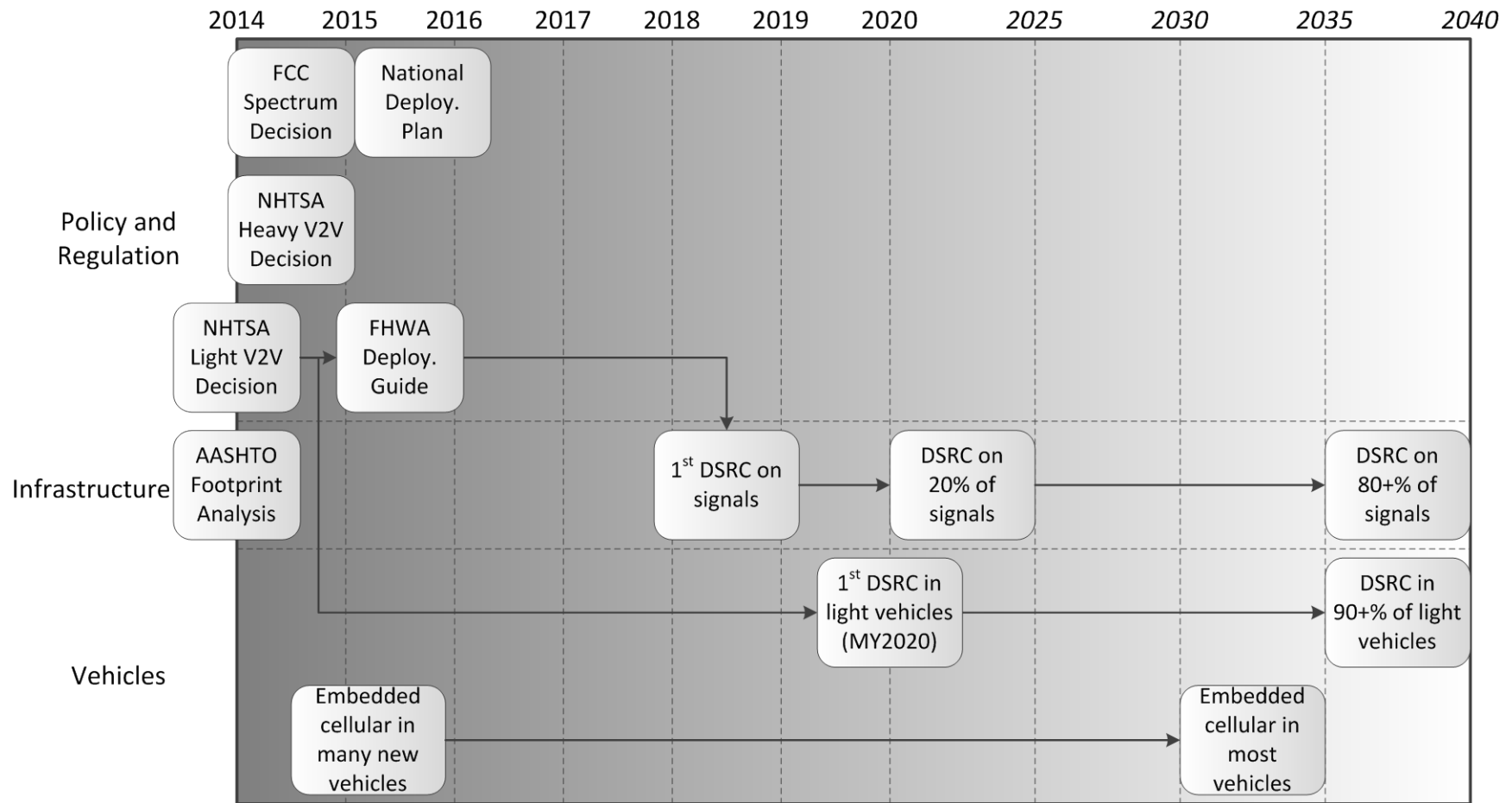
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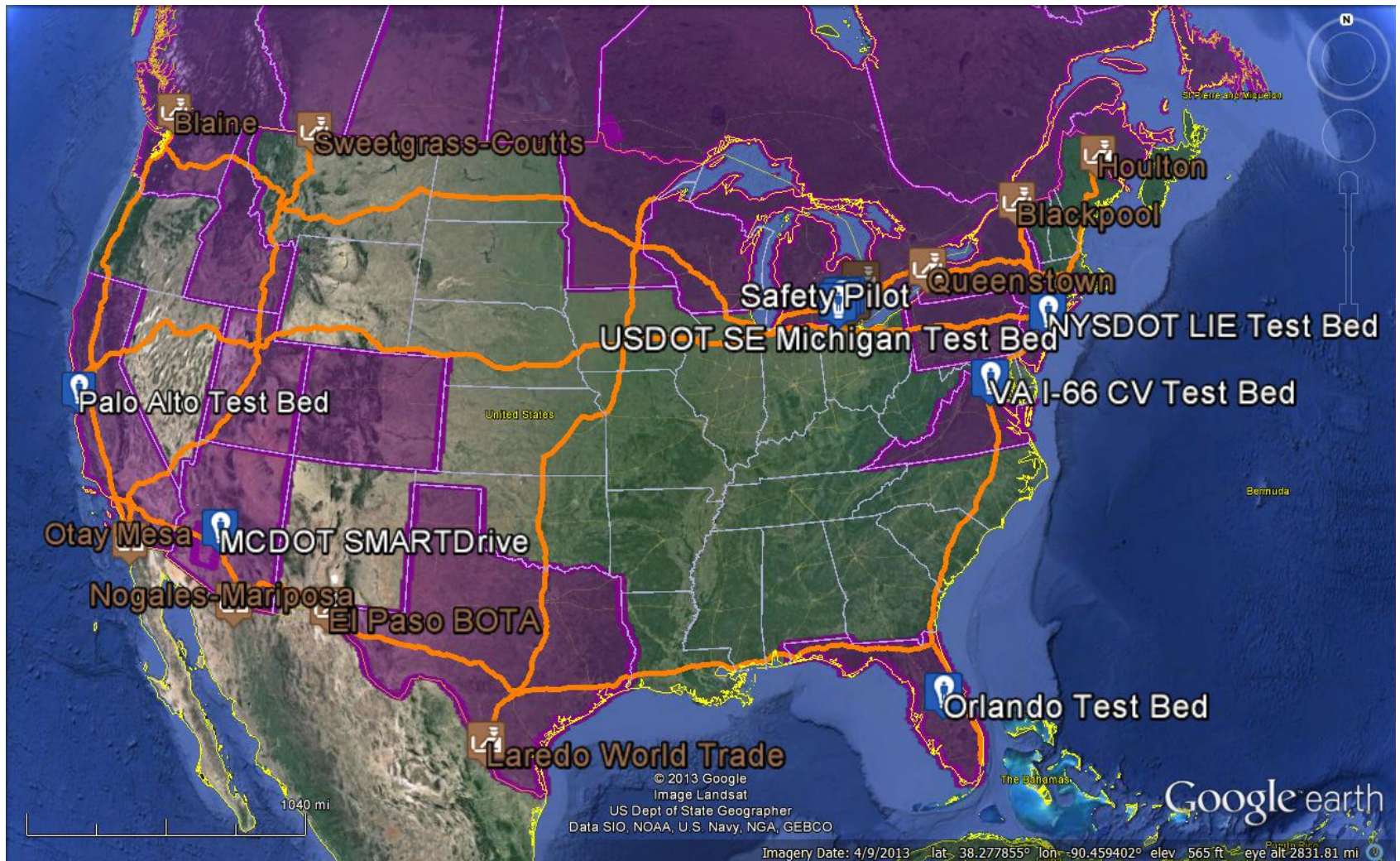
Transport  
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# Estimated Deployment Timeline

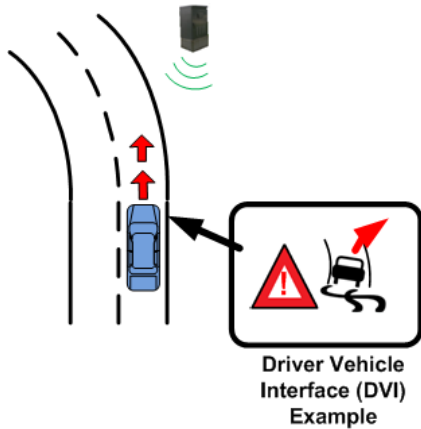


# PFS States → Likely Early Deployments

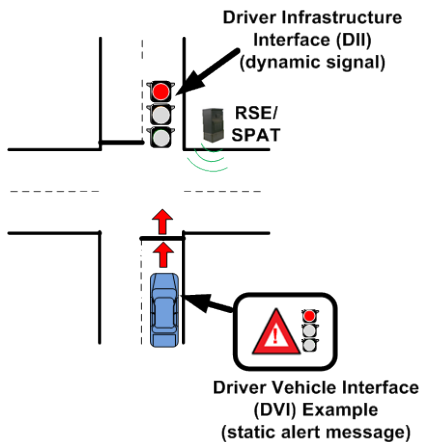


# V2I Safety Applications

## Curve Speed Warning



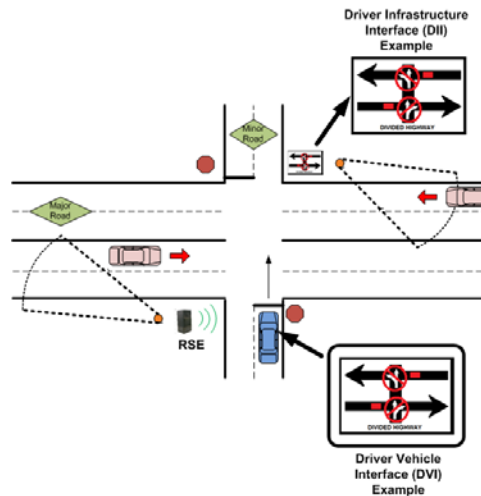
## Red Light Violation Warning



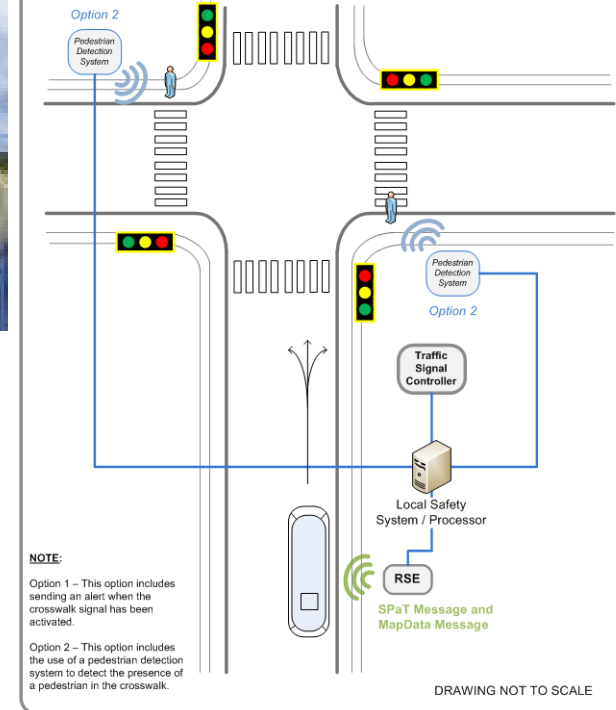
## Smart Roadside



## Stop Sign Gap Assist

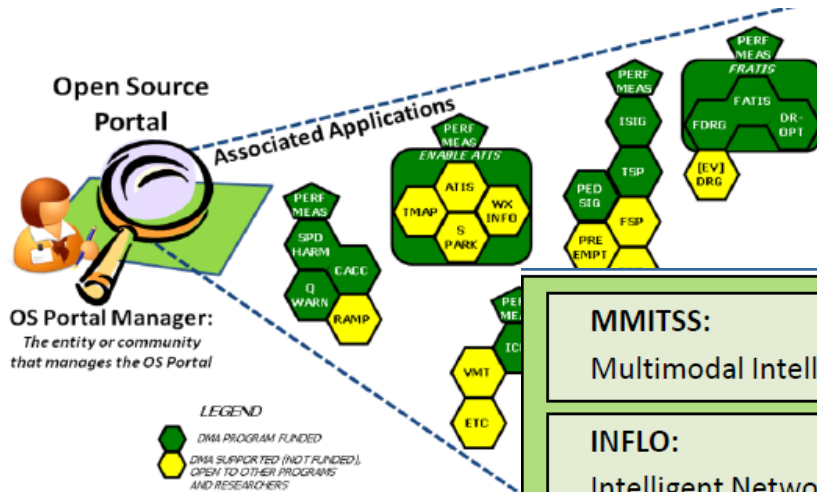


## Pedestrian Warning Application for Transit Vehicles





# V2I Mobility Applications



## MMITSS:

Multimodal Intelligent Traffic Signal System



Ben McKeever

## INFLO:

Intelligent Network Flow Optimization



Mohammed Yousuf

## R.E.S.C.U.M.E.:

Response, Emergency Staging and Communications, Uniform Management, and Evacuation



Linda Dodge

## Enable ATIS:

Enable Advanced Traveler Information Systems



Bob Rupert

## IDTO:

Intelligent Dynamic Transit Operations



Ron Boenau

## FRATIS:

Freight Advanced Traveler Information Systems



Randy Butler

Other Programs:

ICM  
ATDM



Weather



# DSRC Roadside Unit

- Specification 3.0 (prototype unit) is available
  - Used for Safety Pilot
  - [http://www.its.dot.gov/safety\\_pilot/safety\\_pilot\\_qpl.htm](http://www.its.dot.gov/safety_pilot/safety_pilot_qpl.htm)
- Specification 4.0 underway (pre-production unit) based on lessons learned – due in Summer 2014
  - Purpose of Update: to improve performance reliability, strengthen security protocols and promote common configurations and user interfaces across different vendors
  - Key changes

# Signal Phase and Timing Application

- SPaT tested in Safety Pilot:
  - 6 intersections
  - Transit application
  - SPaT data
- Deploying in Affiliated Test Beds to support testing of Multi-Modal Intelligent Traffic Signal System (MMITSS) applications
- ConOps, Interface Control documents, and System Requirements available now – ask [Deborah.Curtis@dot.gov](mailto:Deborah.Curtis@dot.gov)

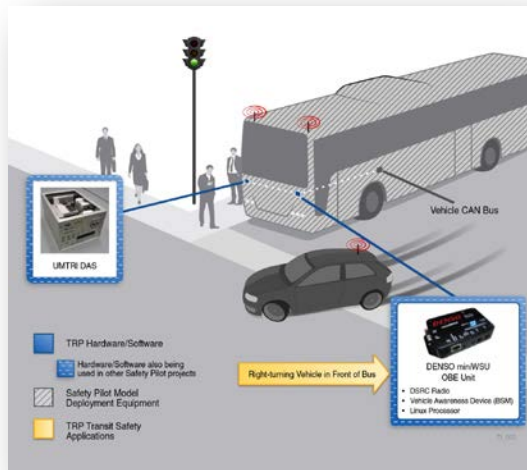


# What's Happening?

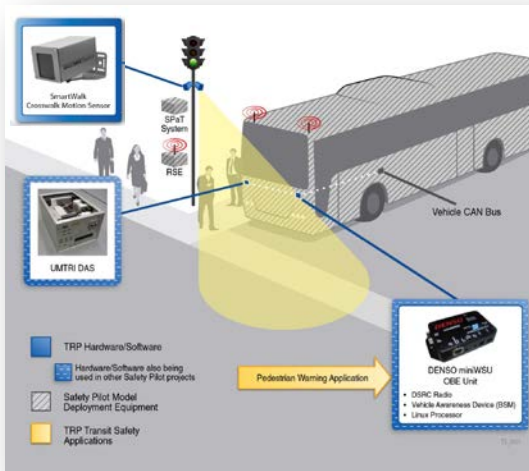
Jeffrey Spencer, Federal Transit Administration

# TRP Retrofit and Applications

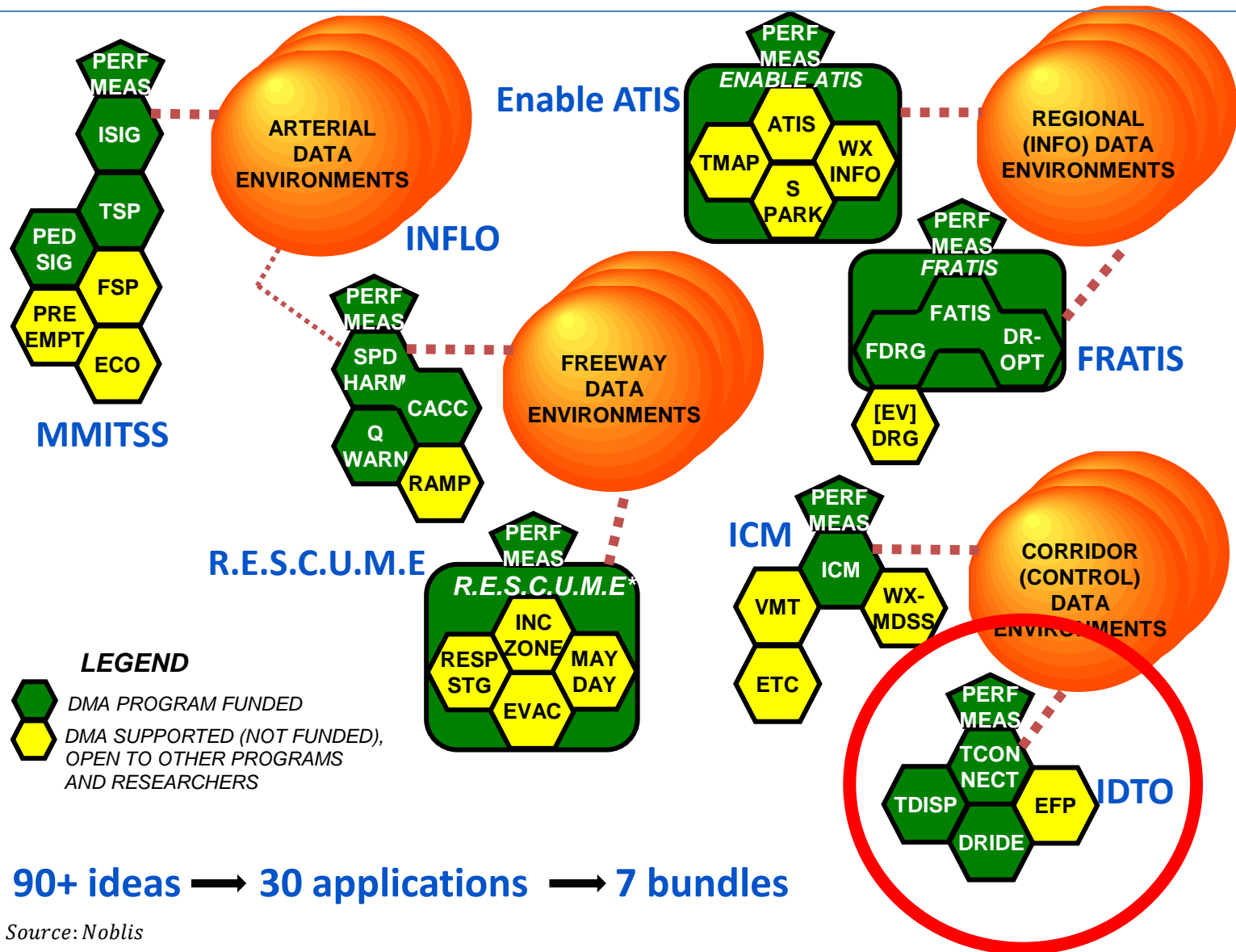
## Right-Turn-In-Front Crash (V2V)



## Pedestrian vs. Turning Bus Crash (V2I)

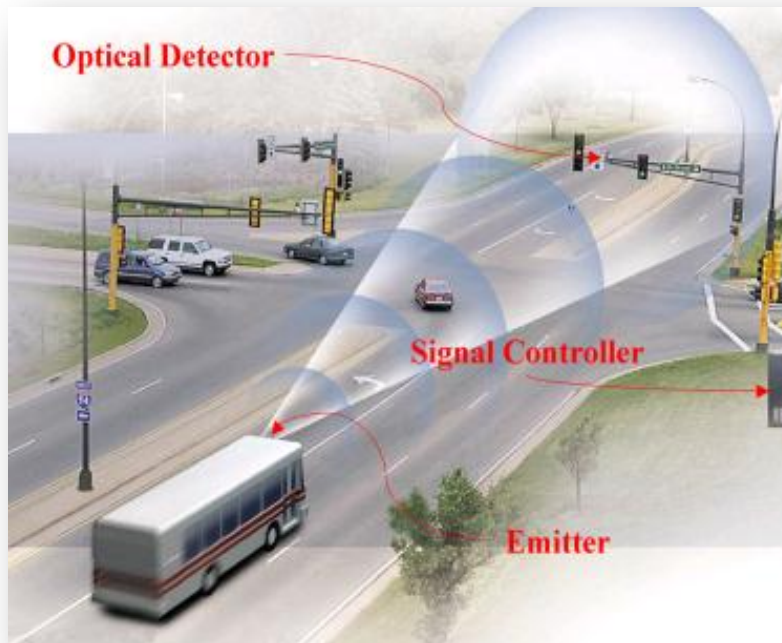


# Data Environments and Mobility Bundles



# AERIS Transformative Concepts

- **Eco-Signal Operations**
- **Dynamic Eco-Lanes**
- **Dynamic Low Emissions Zones**
- **Eco-Traveler Information**
- **Support for Alternative Fuel Vehicle (AFV) Operations**



# Enabling Technologies and Policy

- Architecture and Standards
- Security, Certification, Spectrum
- Data Environments

# CVRIA

<http://www.iteris.com/cvria/index.html>

**CVRIA** CONNECTED VEHICLE REFERENCE IMPLEMENTATION ARCHITECTURE

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Home

## Connected Vehicle Reference Implementation Architecture

Welcome to the Connected Vehicle Reference Implementation Architecture (CVRIA) Website! This site is your tool for reviewing, providing feedback, and using the architecture content for standards and project development. CVRIA is being developed as the basis for identifying the key interfaces across the connected vehicle environment which will support further analysis to identify and prioritize standards development activities. CVRIA will also support policy considerations for certification, standards, core system implementation, and other elements of the connected vehicle environment.

As shown in the figure, CVRIA is developed in 4 Viewpoints:

- Functional - Describes abstract functional elements (processes) and their logical interactions (data flows) that satisfy the system requirements
- Physical - Describes physical objects (systems and devices) and their application objects as well as the high-level interfaces between those physical objects
- Enterprise - Describes the relationships between organizations and the roles those organizations play within the connected vehicle environment
- Communications - Describes the layered sets of communications protocols that are required to support communications among the physical objects that participate in the connected vehicle environment

Latest News

- Connected Vehicle Reference Implementation Architecture Workshop in San Jose, California (April 30 - May 1, 2013)

Stakeholder Feedback

Feedback is encouraged as the CVRIA is developed and maintained. Key stakeholder activities include:

- Reviewing the architecture viewpoints
- Reviewing the standards development plan
- Providing inputs for policy development and review policy options

Please use the [Contact Us](#) page to ask questions or provide comments to the team.

Connected Vehicle Reference Implementation Architecture

Enterprise View

Functional View

Physical View

Communications View

U.S. Department of Transportation  
Research and Innovative Technology Administration

Last Updated 4/2/2013

**DRAFT**

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## ITS Courses and Training

### Talking Transportation Technology (T3) Archives

Welcome to the T3 Webinar Archive! This archive contains over 60 recordings of past T3 Webinars. The archive also includes links to ITS-related webinars produced by ITS PCB partners, including the National Transportation Operations Coalition (NTOC). These recordings are a great way to get up to date quickly on a broad range of ITS topics.

A T3 Webinar archive consists of the following:

- Audio playback
- Presentations delivered in the webinar
- Transcript of the webinar's question and answer discussion
- Webinar announcement, containing the description, learning objectives, and biographies of presenters

If you have any questions about the archive or suggestions about future T3 Webinar topics, [please contact us](#).

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Webinar Title	Date of Webinar	Sponsor
Using ITS to Increase the Effectiveness of Your Traffic Incident Management (TIM) Program (October 30, 2013)	10/30/2013	T3
Keep It Real: Real-Time Transit Traveler Information Systems - 511, Social Media, and More	06/13/2013	T3
Accelerating ITS Implementation - Applying Past Experience to Achieve Future Success	05/08/2013	T3
Smart Traffic Management: Lessons from New York City's Midtown in Motion (MIM) Project	04/16/2013	T3
Road Weather Management Best Practices	01/30/2013	T3
Towards Optimization: Transit Asset Management Strategies	01/24/2013	T3
Keeping Risks in Check: Applying the Updated FHWA Model Systems Engineering Document to Adaptive	12/20/2012	Partner

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Last Updated 4/2/2013

[http://www.pcb.its.dot.gov/t3\\_archives.aspx](http://www.pcb.its.dot.gov/t3_archives.aspx)

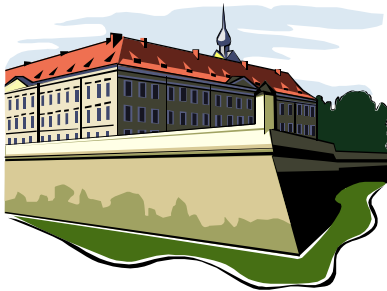
# Next Step for CVRIA

- WORKSHOP:
  - February 19-20, 2014
  - San Francisco, CA
- FOCUS: Proposing candidate Connected Vehicle (CV) interfaces for standardization
- Registration Announcement to be issued soon by ITS JPO. Registration through ITS America.

# V2V Security Communications/ High Level Institutional Capabilities

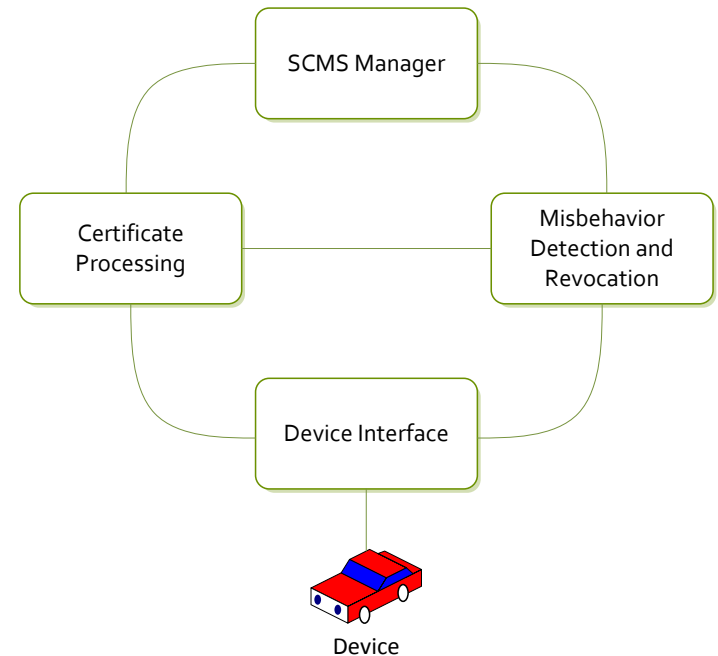
## Main Operations:

1. Device Initialization
2. Certificate Provisioning
3. Misbehavior Detection and Revocation



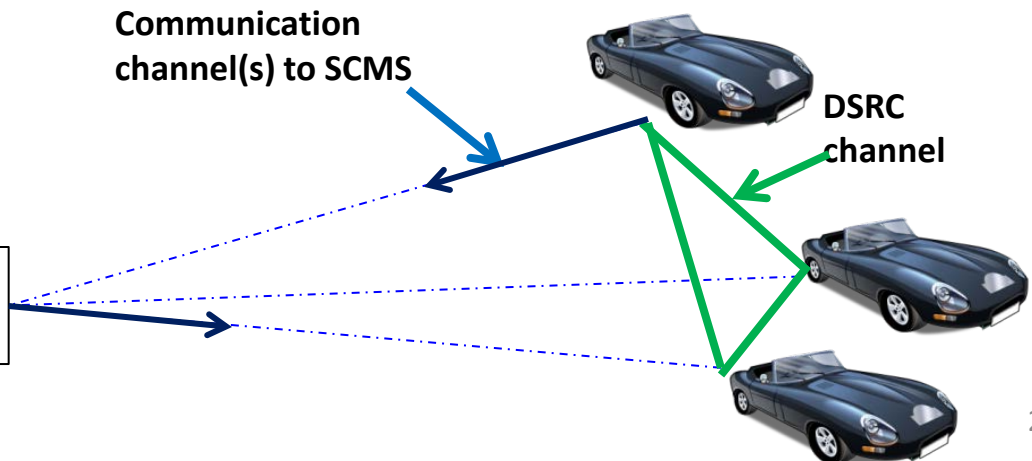
**Security Credential Management System (SCMS)**

Issue and renewal of certificates  
Revocation of certificates



Communication channel(s) to SCMS

DSRC channel





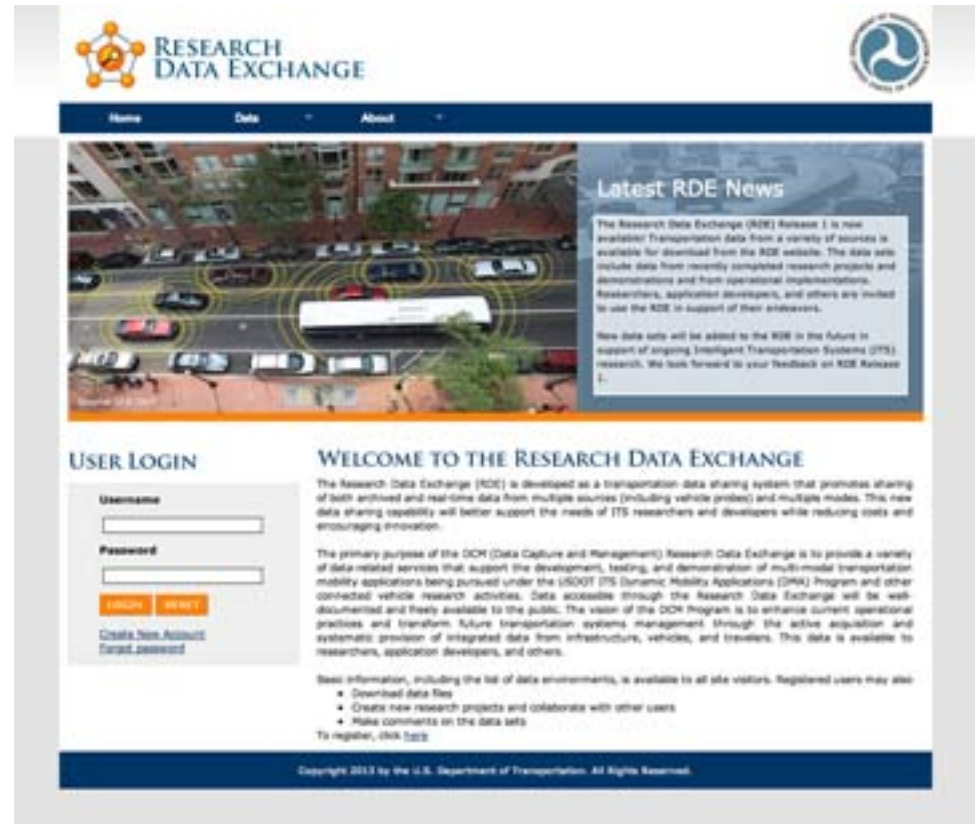
# Policy Research

- Key research is ongoing in the areas of:
  - Security
  - Certification
  - Spectrum

# Data Environment Policies

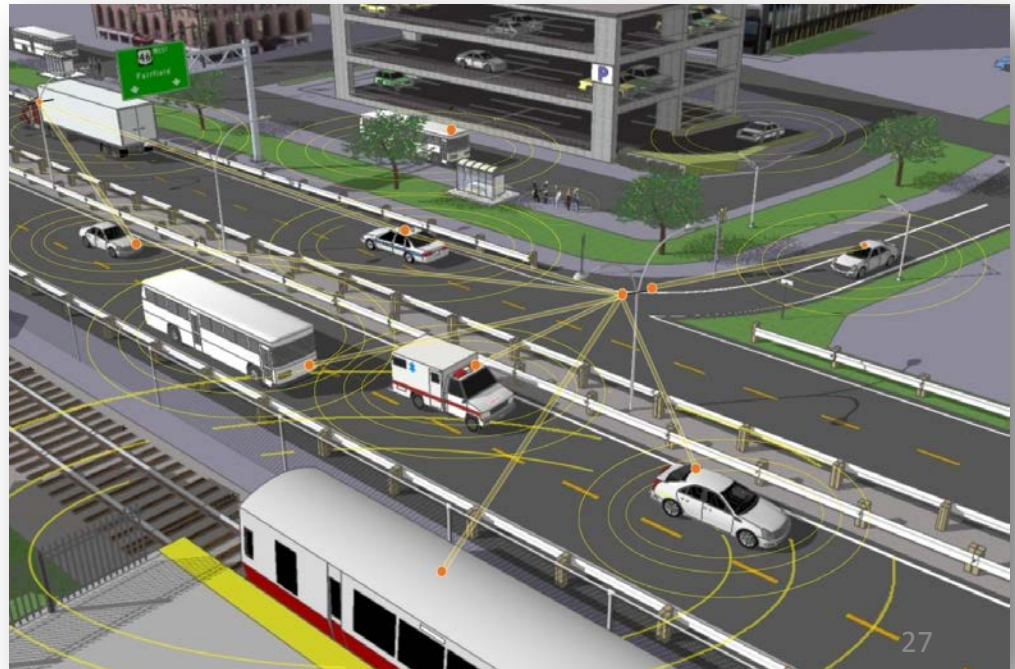
## Managing Multi-Source Data

- Research Data Exchange
  - [www.ITS-RDE.net](http://www.ITS-RDE.net)
  - Leesburg Vehicle Awareness Devices
  - Pasadena network data
  - Multiple Other Sources
  - Safety Pilot – Coming Soon
- High quality, well documented data



# DEPLOYMENT IS NO LONGER JUST A CONCEPT!

- First generation vehicle and roadside technologies have been tested and are nearing completion
- Applications are being prototyped with planned testing in the near future
- Core and enabling technologies are emerging
- Initial timelines and deployment paths are emerging



# Instructions for Break-Out Sessions

- Planning – Executive Room
- Design and Integration – Senate Room
- Institutional and Legal – Capitol Room
- Implementation – Embassy Room
- Operations – Calvert Room
- Transit/Multi-Modal – Stay in Hampton Room

# Next Steps

- Develop a summary of today's meeting
  - Needs and priorities for FHWA guidance
  - Gaps/Open Questions
- Use input for analysis into FHWA process and decisions
- Continue to engage with stakeholders
  - Future thoughts after this meeting
  - Comments on materials / clarifications on topics

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